A coprological assessment of cryptosporidiosis and giardiosis in pigs of mafikeng villages, north west province of South Africa

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ABSTRACT

Cryptosporidium and Giardia are common causes of enteritis in humans and livestock and are contracted by the faeco-oral route with livestock main source of this contamination especially where human and livestock mingle. Mafikeng, in the Northwest province of South Africa has, as a legacy of its homeland past, villages where humans and livestock mingle in the same area. The present study investigated the presence and prevalence of Cryptosporidium and Giardia in faecal samples of pigs raised in 3 different management practices of the different areas of Mafikeng. The overall prevalence of Giardia observed in the whole of Mafikeng was 87%, out of which 36.8% was reported from semi-intensive, 47.4% from intensive and 15.8% from pigs on free range management units. As for Cryptosporidium, overall prevalence was 80%; 34.7% from semi-intensive units, 47.2% from intensive units and 18.1% from free range units. The prevalence levels between different management styles were significantly different with the highest in intensive units because close proximity of animals in such units encouraged transmission. The levels of the parasites in the study site are therefore high but their role in human diseases still needs to be investigated.

Key words: Cryptosporidium, Faeces, Giardia, Pigs, South Africa.

Cryptosporidiosis and Giardiasis are diseases caused by various pathogenic species of the zoonotic ubiquitous protozoan parasites called Cryptosporidium and Giardia, respectively. These parasites are infective to a wide range of mammals, birds, reptiles, amphibians and in the case of Cryptosporidium, fish as well. The frequent association of these parasites with Acquired Immunodeficiency Syndrome (AIDS) in humans as well as the children in poor and disadvantaged communities has led to intensified research of their zoonotic potential and potential risk factors to infection (Snelling et al., 2007, Hunter and Thompson, 2005).

Research on these parasites in livestock has also intensified due to the cases of diarrhoea, reduced weight gain and the importance of animals as potential sources of contamination for humans (Bhat et al., 2012, Maddox-Hyttel et al. 2006 and Olson, 2004). Infective oocysts and cysts of Cryptosporidium and Giardia, respectively, have been demonstrated in run-off from agricultural areas and it has been observed that both are very viable and highly infective at excretion (Hamnes et al. 2006). These infective stages have been observed to survive under harsh environmental conditions outside hosts for long periods of time. They are able to resist standard disinfection like chlorination of drinking water (Monis and Thompson, 2003) so can easily remain viable for transmission after contamination of water and feed sources. Most transmission occurs through the faeco-oral route by either direct contact from person-to-person, water-borne transmission, food-borne transmission or animal-to-person transmission requiring few oocysts (DuPont et al., 1995, Randhawa et al. 2012, Sadek et al. 2013 and Smith et al. 2007), therefore determining the sources of contamination is a priority in stemming infections.

The practice of keeping susceptible animals in close contact with each other and with stressed and immunocompromised humans enhances the spread of Cryptosporidium and Giardia (Olson et al. 1996 and Olson et al. 2004). In addition, during heavy rainfall the oocysts and cysts can be washed away from animal sources leading to contamination of water sources used for human consumption. In Mafikeng Villages of South Africa, the...
practice of keeping free range, semi-intensively and intensively reared pigs within the densely populated villages is widespread. These villages are a legacy of the pre-independence era and some do not have proper sanitary facilities. Presence of livestock especially pigs within close proximity of human housing is a known common cause for zoonotic diseases, such as *Giardia* and *Cryptosporidium*. Unfortunately, little is known about the presence of *Giardia* and *Cryptosporidium* in livestock faeces, especially in pigs of this area. So, this study investigated the presence of these zoonotic pathogens in pigs reared in the villages of Mafikeng in the North West province of South Africa.

**Study area and sample collection:** The study was carried out between July and November 2013. A total of ninety faecal samples were collected from pigs aged between six months to three years old from 22 villages of Mafikeng, Northwest province of South Africa. The place was historically a part of the Bophuthatswana Bantustan (figure 1). As a legacy of the Bantustan era, villages were usually very congested and keeping of livestock in such places carries with it high zoonotic diseases risks. The management style of pigs of each sampling location was noted carefully.

Fresh samples were collected off the ground from the upper side to ensure that they had not been in contact with the floor. They were then put in individually labelled plastic bags and placed directly into a cold pack with ice. Thereafter they were transported to the laboratory and stored in a refrigerator at 4°C. The weight of each sample collected was approximately 10 grams. Sampling was done conveniently i.e. on the basis of pigs available in the specified area as a result some areas had fewer animals sampled.

**Sample preparation and testing:** Antigen ELISA Commercial kits (Wampole *Giardia* ii catalogue No. 30405 and *Cryptosporidium* ii catalogue No.30406) were used in the study. Faecal samples were removed from the refrigerator and were left to gain room temperature. Processing of the samples was then carried out as per manufacturer’s instructions using 0.1 gram of faecal samples. Sample processing for ELISA was also carried out as per procedure. Six controls (two at the beginning and four at the end of the micro assay plate) wells were prepared to serve as positive and negative controls for both *Giardia* and *Cryptosporidium* tests. The colour change reactions were stopped by a stop solution (provided in the kit) and measured at an absorbance of 450 nm on a micro plate ELISA reader.

**Data analysis:** A simple t-test was used to determine differences between management practices at a level of 5% or less (P<0.05) regarded as significant by using IBM SPSS version 22 statistical software.

Both *Giardia* and *Cryptosporidium* were detected at most study sites. Table 1 shows the study sites, the number of pigs sampled, pigs positive for *Giardia* and the management style of the targeted pig units. The overall prevalence of *Giardia* in the whole of Mafikeng was found to be 87%. Of the 76 samples that tested positive for *Giardia*, 28 (36.8%) were from semi-intensive management units, 36 (47.4%) were from intensive management units, and 12 (15.8%) were on free range.

Table 2 shows the results of samples tested for *Cryptosporidium*. The overall prevalence of cryptosporidiosis was 80%. However, the descriptive study as per the management system revealed, 25 (34.7%) positive samples were from semi-intensive units, 34 (47.2%) from intensive management units, and 13 (18.1%) were from pigs on free range.

For both parasites, significant differences were determined in prevalence levels in the different pig management practices. For both parasites, the highest prevalence was in those pigs kept under intensive practices while the lowest was among the free range ones.

From this study it was apparent that *Cryptosporidium* and *Giardia* infections were widespread in pigs of all villages in Mafikeng. At the prevalence rates of 80 and 84% for the parasites, respectively, it is obvious that the rates are rather very high in the area and should therefore be
Cause for concern. It was also observed that higher infection rates were among pigs that are intensively reared. This is to be expected since pigs in such units are continuously contaminating each other and this underscores the importance of close contact in the transmission cycle of these pathogens (Olson et al. 1996). Even though these prevalence rates are high, similar studies carried out in other countries have also reported similar prevalence levels for Cryptosporidium where it has been found to range from 14 to 89% for individual pigs (Budu-Amoako et al. 2012) and 31 to 100% for swine herds (Maddox-Hytel et al. 2006). The danger of such high prevalence levels were highlighted in those countries and the same would therefore apply in this case.

High prevalence rates of these pathogens in Mafikeng should be regarded as a great zoonotic risk. The close contact between these animals and humans in the villages and also the practice in these villages of using livestock faeces as manure for crops and vegetables exposes humans to the pathogens. It was not possible from this study...
to know whether these high animal infection rates translate into human infections because data on human infections was not collected at the time. However it is known that these pathogens are very infectious and pose high disease risks especially in children and the immunosuppressed and that infection in humans can be traced from animal sources (Olsen et al. 2004). Porcine Cryptosporidium is also known to have multiple transmission cycles that are host specific, age specific and across species (Monis and Thompson, 2003 and Thompson et al. 2008) and because currently there are no effective treatments or disinfectants, the risk to humans in an area cannot be overlooked (Johnson et al. 2008 and Yin et al. 2013). Therefore, there is a need to further investigate the impact on humans due these high prevalence rates in pigs. In spite of this knowledge gap, remedial measures should be put in place to reduce risk to humans.

REFERENCES


